Abhrajyoti Kundu
Computer Science & IT (CS)

BASIC LEVEL FULL SYLLABUS TEST -1 (GATE 2023) - REPORTS

OVERALL ANALYSIS | COMPARISON REPORT | SOLUTION REPORT

ALL(65) | CORRECT(44) | INCORRECT(14) | SKIPPED(7)

Q. 11 Have any Doubt ?

We are given a hash table H which has 2^{20} elements and an unknown number of slots. If the load factor α for H is equal to 2^{10}, then the number of slots in H is equal to _____.

1024 — Correct Option

Solution :
1024

$$\text{Given,} \quad \text{Load factor} = 2^{10} = \frac{\text{Total number of elements in H}}{\text{Number of slots in H}}$$

$$= \left(\frac{2^{20}}{x}\right) = 2^{10}$$

Solving for x, we get $x = 2^{10}$.
Therefore number of slots will be 1024.

Your Answer is 1073741824

QUESTION ANALYTICS +

Q. 12 Have any Doubt ?

Let X be the number of 2 input NAND gates required to implement a full adder, and Y be the number of 2 input NAND gates required to implement a full subtractor. Then the value of $X - Y$ is _____.

0 — Your answer is Correct0

Solution :
0
Both full adder and full subtractor require 9 NAND gates for implementation.
Therefore $X - Y$ is 0.

QUESTION ANALYTICS +

Q. 13 Have any Doubt ?

Consider a new sorting algorithm similar to the bubble sort algorithm, called RumbleSort. Given an array as input, RumbleSort attempts to sort the array and produces a sorted array as output.Here's the pseudocode for RumbleSort.

```
RumbleSort(L):
        let sorted = false
        while not sorted:
            sorted = true
            for i := 0; i < len(L) -2; i++:
            if  L[i] > L[i + 2]:
                    sorted = false
                    reverse the given list from L[i] to L[i + 2] (inclusive)
```

Consider running RumbleSort on the following inputs. For which of the inputs given below, does RumbleSort produce the correct sorted array?

A. [5 6 8 4 3] — Correct Option

B. [5 6 4 8 3]

C. [3 4 8 6 5] — Your option is Correct

D. [5 4 8 6 3] — Correct Option

YOUR ANSWER - c | CORRECT ANSWER - a,c,d | STATUS -

Solution :
(a, c, d)
RumbleSort algorithm fails to correctly sort the second input. Other inputs work fine.

QUESTION ANALYTICS +

Q. 14 Have any Doubt ?

Which of the following is true?
I. If a Mealy Machine is converted into a Moore Machine, then the number of states don't change.
II. If a Moore Machine is converted into a Mealy Machine, then the number of states don't change.

A Only I

B Only II — Your answer is **Correct**

Solution :
(b)
Only II is true. If an N state Mealy Machine having M outputs is converted into a Moore machine, then the resulting machine can have upto MN states, so we can have M(N − 1) additional states after the conversion. So I is false. II is true as there's no change in the number of states after conversion. So correct choice is (b).

C Both I and II

D None of these

QUESTION ANALYTICS +

Q. 15 Have any Doubt ?

Consider the following instance of a boolean matrix M of order 5 x 5.

True	False	False	False	True
False	True	False	True	False
False	False	True	False	False
False	True	True	True	False
True	True	True	True	True

Each entry $M[i, j]$ is assigned either true or false. Also assume that the rows and columns are indexed from 1 to 5 in the matrix. Now consider the following predicate logic statements over the matrix M.

I. $\forall i \, \forall j \, [(i + j = 6) \Rightarrow (M[i, j] = \text{true})]$
II. $\forall i \, \exists j \, [M[i, j] = \text{false}]$
III. $\exists i \, \forall j \, [M[i, j] = \text{true}]$
IV. $\forall i \, \forall j \, [(i = j) \Rightarrow (M[i, j] = \text{true})]$

Which of the above statements hold true for the above matrix instance *M*?

A II only

B II, III only

C I, II, III but not IV

D I, III, IV but not II — Your answer is **Correct**

Solution :
(d)
Let's see why (d) is true.
III is the easiest to start with. It says "there's a row such that all the entries in that row are true". The last row satisfies this claim hence III is true.
II says "Every row has at least one entry which is false" which is not true, as the last row has all the entries true. Also, II is actually the negation of III if you notice clearly. So III being true makes II false implicitly.
Now let's see IV and I.
IV says "all the principal diagonal elements are true" which is correct, as observed in the matrix.
I says "all the anti-diagonal (the non-principal diagonal of matrix) elements are true" which is also correct and can be seen from the matrix.
So the correct choice is option (d).

QUESTION ANALYTICS +

Q. 16 Have any Doubt ?

Which of the following statements is true?

A ROM is a Read only memory. Your option is **Correct**

B PC points to the next instruction to be executed. Your option is **Correct**

C Stack works on the principle of LIFO. Your option is **Correct**

D All instructions affect the flags.

YOUR ANSWER - a,b,c | CORRECT ANSWER - a,b,c | STATUS - ✓

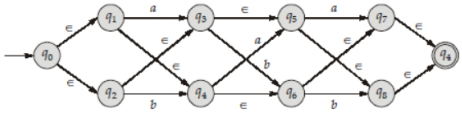
Solution :

(a, b, c)
All options except (d) are true.
So (a), (b), (c) are correct.

QUESTION ANALYTICS +

Q. 17 Have any Doubt ?

Consider the following ∈-NFA over the alphabet {*a*, *b*}.



Let *X* be a set such that $X = \delta^*(q_0, \in)$, where δ^* represents the extended transition function. Then which of the following states belong to *X*?

A q_0 Your option is **Correct**

B q_4 Your option is **Correct**

C q_7 Your option is **Correct**

D q_9 Your option is **Correct**

YOUR ANSWER - a,b,c,d | CORRECT ANSWER - a,b,c,d | STATUS - ✓

Solution :

(a, b, c, d)

$$X = \delta^*(q_0, \in) = \{q_0, q_1, q_2, q_3, q_4, q_5, q_6, q_7, q_8, q_9\} = Q$$

Since X contains all the states, therefore all the given options are true.

QUESTION ANALYTICS +

Q. 18 Have any Doubt ?

Consider a system having 22 resources of the same type. These resources are shared by 4 processes *P*, *Q*, *R* and *S* having peak demands of 3, 6, a and b respectively. How many ordered pairs (*a*, *b*) are possible, such that the system is deadlock free? _____.

969 Correct Option

Solution :

969

The system will be free from deadlock if, $(3 - 1) + (6 - 1) + (a - 1) + (b - 1) + 1 <= 22$
or, $a + b <= 16$; where $a, b >= 0$
Number of ordered pairs (a, b) making sure that the system remains deadlock free, is equal to the number of solutions to the above equation. Now we'll make use of counting principles learnt in discrete maths to find the number of solutions to this.
Using the 'box' method, the above inequality can be reduced to,

$$a + b + c = 16; a, b, c >= 0$$

$$\text{Number of solutions} = {}^{3-1+16}C_{16} = 969$$

QUESTION ANALYTICS +

Q. 19

Have any Doubt ?

The following C program is executed on a Unix / Linux system.

```
#include <unistd.h>
int main( ) {
    int i;
    for (i = 1; i <= 50; i++)
        if (i % 5 == 0 || i%7 == 0) fork( );
    return 0;
}
```

Then the number of child processes created is equal to _____.

65535 — Correct Option

Solution :
65535

If k is the total number of fork calls, then number of child processes created = $2^k - 1$

Let's find the total number of fork calls first.

Total number of fork calls = Number of integers between 1 and 50 which are divisible by either 5 or 7

$= n(\text{divisible by } 5) + n(\text{divisible by } 7) - n(\text{divisible by } 35)$

$= 10 + 7 - 1 = 16$

So, number of child processes = $216 - 1 = 65535$

Your Answer is 8191

QUESTION ANALYTICS +

Q. 20

Have any Doubt ?

Consider a database with 5 records, as shown below:

Name	Age	Occupation	Category
Amit	28	Engineer	X
Kirti	26	Accountant	Y
Saisha	25	Banker	Z
Krishna	22	Researcher	Z
Sachin	30	Businessman	Y

An index file which is associated with this database contains the values 2, 3, 5, 1, 4. Which one of the fields is the index built from?

A Name

B Age

C Occupation — Your answer is **Correct**

Solution :
(c)
If we sort occupation in lexicographical order, we'll get the sequence 2, 3, 5, 1, 4, which matches with what is present inside the index file. So option (c) is the answer.

D Category

QUESTION ANALYTICS +